LauncherOne Collaborative Opportunity to Advance Emerging Space Capabilities

Completed Technology Project (2015 - 2018)

Project Introduction

Virgin Galactic, LLC ("Virgin Galactic") is in the midst of the design and development effort for our LauncherOne small satellite launch capability. LauncherOne is a dedicated small satellite launch system manufactured and planned for launch in the U.S. that is designed to deliver approximately 300-500 kg of payload to Low Earth Orbit. LauncherOne (L1) is an expendable, two-stage, liquid propulsion (LOX/RP-1) rocket released at a high altitude by a carrier aircraft. LauncherOne is a highly vertically integrated rocket system with major subsystems (liquid propulsion systems, tanks, and avionics) designed, developed, and manufactured in-house by Virgin Galactic at our Long Beach and Mojave, California facilities. We see beneficial technical alignment between the core capabilities of NASA Ames Research Center and our LauncherOne development needs and risk areas. We would be engaged with NASA Ames Research Center in the area of Suborbital reusable and small satellite launch systems development (Topic 1) with an emphasis on Air Launch Systems (Subtopic 1). The efforts where we would like to partner with NASA Ames Research Center can be divided into the following categories – all of which advance the development for our air launch solution addressing the ACO Topic 1 for the development and commercialization of a small launch system. The first category would be aerothermodynamics. This would include Computational Fluid Dynamics (CFD) analysis of the carrier aircraft and LauncherOne configuration, assessment of the proposed LauncherOne Thermal Protection System (TPS), and exploration of future reusability concepts. The second category would be aircraft simulation lab support. This would include carrier aircraft dynamics in the configuration with LauncherOne through various phases of flight in the aircraft simulation laboratory, access to subject matter experts to help accelerate our team's readiness to use the carrier aircraft for an air launch platform. The third category would be small satellite launch vehicle enabling technologies. This would include Payload integration and adapter options for rapid integration and operation of the LauncherOne vehicle and possible extensions to the LauncherOne design to accommodate more robust small satellite missions. Through these efforts NASA and Virgin Galactic will gain a better understanding of air launch systems, enable future recommendations for the design and optimization of air launch system and improve the development of such vehicles.

Anticipated Benefits

NASA and Virgin Galactic will gain a better understanding of air launch systems, enable future recommendations for the design and optimization of air launch system and improve the development of such vehicles. These solicitations increase focus on collaborations with the commercial space sector that not only leverage emerging markets and capabilities to meet NASA's strategic goals, but also focus on industry needs. NASA's investments in industry partnerships can accelerate the availability of, and reduce costs for the development and infusion of, these emerging space system capabilities.

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Table of Contents

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Virgin Orbit

Responsible Program:

Flight Opportunities

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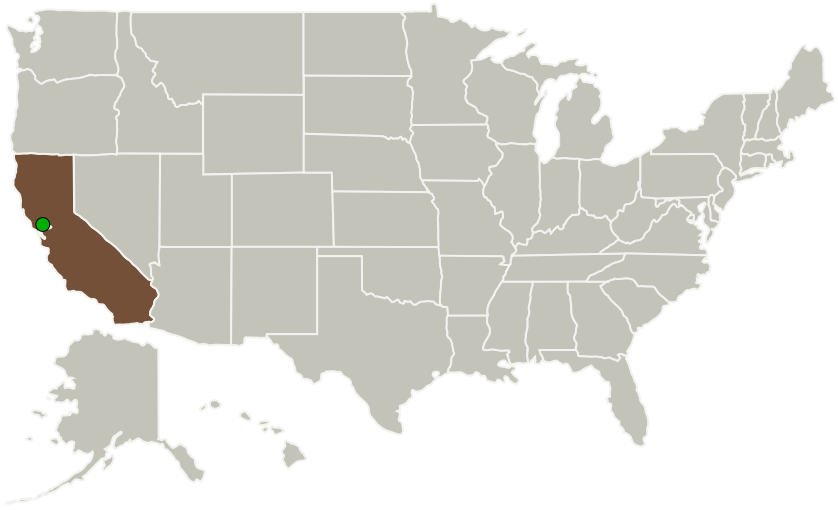
While developing the technology to enable NASA's next generation of science and human exploration missions, we will grow the economy and strengthen the nation's economic competitiveness.

Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Virgin Orbit	Lead Organization	Industry	Long Beach, California
Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California

Primary U.S. Work Locations
California

Links

Virgin Orbit carries out successful LauncherOne drop test - Space News *(https://spacenews.com/virgin-orbit-carries-out-successful-launcherone-drop-test/)*

Project Management

Program Director:
Christopher E Baker

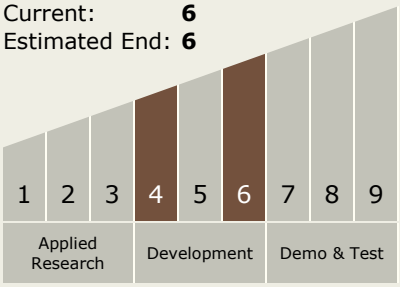
Program Manager:
John W Kelly

Principal Investigator:
Ac Charania

Co-Investigator:
Harry Partridge

Technology Maturity (TRL)

Start: **4**
Current: **6**
Estimated End: **6**



Target Destination

Earth